

APPLICATION OF FUNCTIONAL TRAINING ON PHYSICAL FITNESS IN BASKETBALL



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APLICAÇÃO DO TREINAMENTO FUNCIONAL SOBRE A APTIDÃO FÍSICA NO BASQUETEBO

APLICACIÓN DEL ENTRENAMIENTO FUNCIONAL EN LA APTITUD FÍSICA EN EL BALONCESTO

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ABSTRACT

Introduction: Basketball is a predominant competitive sport among the masses. Its practice requires scoring as many points as possible within a specific time limit, manifesting a short-duration, high-intensity intermittent training session. To meet the sport's requirements, the athlete must have ample directional control, rapid changes in speed, and good jumping ability. **Objective:** Verify the effects of functional training on basketball players aiming to improve explosive power, stability, and agility. **Methods:** 18 college basketball players were randomly selected as volunteers for the investigation. They were randomly divided into experimental and control groups. Only to the experimental one was functional physical training added during routine training. The trial lasted for eight weeks. All participants were tested for agility, strength, speed, endurance, power, and cartilage repair before and after the experiment. Finally, a comprehensive statistical data analysis was performed. **Results:** There were significant differences between the experimental group and the control group in push-ups, 3200-meter run, physical acuity detection, 17 sidelines, and running items, and touch height ($P<0.05$). In the experimental group, there was no significant difference in high school grades ($P>0.05$). There was significant statistical significance in the supine project, the 3200-meter athletics project, the 17 sideline projects, and the touchdown project ($P<0.05$). **Conclusion:** The physical fitness of the experimental group improved significantly after functional physical training. After routine physical training, the control group athletes had significantly positive absolute strength and endurance results. Overall, functional fitness training is superior to conventional fitness training. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: Physical Conditioning, Human; Endurance Training; Physical Fitness; Basketball.

RESUMO

Introdução: O basquetebol é um esporte de competição predominante entre as massas. Sua prática requer o maior número possível de pontos dentro de um limite de tempo específico, manifestando uma sessão de treinamento intermitente de curta duração e de alta intensidade. Para atender aos requisitos esportivos, é necessário que o atleta tenha um amplo controle direcional, mudanças rápidas de velocidade e boa capacidade de salto. **Objetivo:** Verificar os efeitos do treinamento funcional em jogadores de basquetebol visando melhorar o poder explosivo, estabilidade e agilidade. **Métodos:** Foram selecionados aleatoriamente 18 jogadores universitários de basquetebol como voluntários para a investigação. Divididos aleatoriamente em grupos experimental e controle. Apenas ao experimental foi adicionado o treinamento físico funcional durante o treinamento de rotina. O ensaio durou oito semanas. Todos os participantes foram testados quanto a agilidade, força, velocidade, resistência, potência e reparo de cartilagem antes e depois do experimento. Finalmente, efetuou-se uma abrangente análise estatística de dados. **Resultados:** Verificou-se diferenças significativas entre o grupo experimental e o grupo de controle em flexões, 3200 metros de corrida, detecção de acuidade física, 17 itens de linha lateral e itens de corrida e altura de toque ($P<0,05$). No grupo experimental, não houve diferença significativa nas notas do ensino médio ($P>0,05$). Houve significância estatística significativa no projeto de supino, no projeto de atletismo de 3200 metros, nos 17 projetos de linha lateral, e no projeto de retoque ($P<0,05$). **Conclusão:** A aptidão física do grupo experimental melhorou significativamente após o treinamento físico funcional. Após o treinamento físico de rotina, os atletas do grupo de controle tiveram resultados significativamente positivos sobre força e resistência absolutas. Em geral, o treinamento de aptidão física funcional é superior ao treinamento de aptidão física convencional. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Condicionamento Físico Humano; Treinamento de Resistência; Aptidão física; Basquetebol.

RESUMEN

Introducción: El baloncesto es un deporte de competición predominante entre las masas. Su práctica requiere el mayor número posible de puntos dentro de un límite de tiempo específico, manifestando una sesión de entrenamiento intermitente de corta duración y alta intensidad. Para cumplir con los requisitos deportivos, es necesario que el atleta tenga un amplio control direccional, rápidos cambios de velocidad y una buena capacidad de salto. **Objetivo:** Verificar los efectos del entrenamiento funcional en jugadores de baloncesto con el objetivo de mejorar la potencia explosiva, la estabilidad y la agilidad. **Métodos:** 18 jugadores de baloncesto universitario fueron seleccionados al azar como voluntarios para la investigación. Se dividieron aleatoriamente en grupos experimentales y de control. Sólo al experimental se



le añadió el entrenamiento físico funcional durante el entrenamiento rutinario. La prueba duró ocho semanas. Todos los participantes fueron sometidos a pruebas de agilidad, fuerza, velocidad, resistencia, potencia y reparación del cartílago antes y después del experimento. Por último, se realizó un exhaustivo análisis estadístico de los datos. Resultados: Hubo diferencias significativas entre el grupo experimental y el grupo de control en las flexiones de brazos, la carrera de 3200 metros, la detección de la agudeza física, los 17 elementos de la banda y la carrera y la altura del toque ($P < 0,05$). En el grupo experimental, no hubo diferencias significativas en las calificaciones de la escuela secundaria ($P > 0,05$). Hubo una significación estadística significativa en el proyecto de decúbito supino, el proyecto de 3200 metros de atletismo, los 17 proyectos de banda y el proyecto de touchdown ($P < 0,05$). Conclusión: La aptitud física del grupo experimental mejoró significativamente tras el entrenamiento físico funcional. Tras el entrenamiento físico rutinario, los atletas del grupo de control obtuvieron resultados significativamente positivos en cuanto a fuerza y resistencia absolutas. En general, el entrenamiento de aptitud física funcional es superior al entrenamiento de aptitud física convencional. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Acondicionamiento Físico Humano; Entrenamiento de Resistencia; Aptitud Física; Baloncesto.

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INTRODUCTION

Young basketball players' muscle explosiveness, endurance, and flexibility are all in the stage of rapid development. If coaches can carry out reasonable physical exercise, they can develop their physical functions better and exercise their formidable willpower. In the daily exercise of basketball players, functional physical training has become a focus of physical education in colleges and universities. This must cause enough attention.¹ This paper takes 18 young players as the research object. This article compares conventional physical training with functional physical training. The training period for each set is eight weeks. The learning effect of each stage is carried out by comparing the evaluation index. This paper mainly analyzes the differences between functional physical and conventional physical training in improving the physical fitness of young basketball players.

METHOD

Experimental subjects

This paper selects 18 college basketball players for investigation. The subjects were randomly divided into two groups. One class is used as the experimental group. One group served as a control group.² There was no significant difference in general data and physical fitness between the two groups before the experiment ($P < 0.05$).

Test plan

Functional physical training includes three aspects: First, basic functional physical training. Coaches focus on building a solid foundation in terms of physical stability, physical strength, and more. The second section is regular physical exercise. Athletes mainly train from the aspects of endurance, speed, flexibility, coordination, and so on. This stage lays a solid foundation for the following special physical training. The third stage is specialized technical training.³ Its goal is to enable athletes to develop solid fundamentals in professional competition. Based on the above research results, this paper established an index system for evaluating the effectiveness of functional physical training. (Table 1)

Regular physical training uses high-intensity exercise. Functional fitness is a dynamic chain that treats the body as a whole. It focuses on

Table 1. Efficacy evaluation indicators of functional physical exercise.

Category	Test items
Speed force	Standard push-ups, 3200m track and field run touch height
Physical flexibility	Body acuity detection in limited areas
Special skills basic training	13% off the sideline of the basketball court for four times, run up and touch high

constructing motion models, focusing on the control of nerves over the body when the athlete is unstable.

Sports injury model in sports training

In this paper, a random vector model of Q dimension is established according to $M = (M_1, M_2, \dots, M_Q)$ when athletes are over-training in basketball.⁴ The second-order moment of the impact of basketball players' excessive physical training on joints is expressed as follows

$$G(M) = _, \delta(M) = \Theta \quad (1)$$

J is a constant vector in a basketball player's overload exercise, the exercise load parameter that affects the athlete's joint injury. In this paper, the linear transformation matrix of the athlete's joint injury factor is constructed according to the $J_j' J_j = 1, J = 1, 2, \dots, q$ limited model.

$$\begin{cases} S_1 = J_1 M = j_{11} M_1 + J_{q1} M_Q \\ S_2 = J_2 M = j_{12} M_1 + J_{q2} M_Q \\ S_Q = J_Q M = j_{1Q} M_1 + J_{qQ} M_Q \end{cases} \quad (2)$$

In this paper S_1 replaces Q and becomes the initial variable M_1, M_1, \dots, M_Q in the construction of the basketball excessive physical training model.

Combined with statistical principles, this paper analyzes the correlation between basketball players' excessive physical training and joint injury factors.⁵ At the same time, this paper comprehensively evaluates basketball players' excessive physical training.

$$Var((S_j)) = J_j' \Theta J_j \quad (3)$$

$$COV((S_j, S_j)) = J_j' \Theta J_j \quad (4)$$

In the basketball player's physical training model, the larger the value of $Var(S_1)$, the more information S_1 contains on the influencing factors of sports. J_j refers to the correlation between excessive physical training of basketball players and the factors affecting it. Θ is the covariance of M . In this paper, the following formula derives a model of an athlete's injury due to excessive exercise load.

$$M = (M_1, M_2, \dots, M_Q)' \quad (5)$$

This paper uses the following formula to describe the relevant matrix of the joint damage model caused by excessive physical training of basketball players

$$H = \frac{1}{n-1} M' M \quad (6)$$

In this paper, the damage model of the knee joint caused by exercise load was constructed according to the following formula during basketball players' excessive physical training.

$$S_j = a_{i1} \frac{M_1 - \overline{M_1}}{S_1} + a_{i2} \frac{M_2 - \overline{M_2}}{S_2} + a_{ip} \frac{M_p - \overline{M_p}}{S_p} \quad (7)$$

Mathematical and statistical methods

This paper uses the data processing program of SPSS21.0 to describe the correlation between the experimental and control groups.⁶ The significant difference level was controlled at 0.05.

Ethical Compliance

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Guangzhou Sport University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

After eight weeks of functional physical training three times a week, the test results of 9 players in the experimental group are compared with those before the test, as shown in Table 2. There were significant differences in the 30-second average of the standard sit-up items, the 3200-meter long-distance running, the physical sensitivity test item, the 4-time basketball court sideline 17-turn-back item, and the running touch-height item test in the experimental group compared with those before training ($P < 0.05$). The results showed that the experimental group's performance in the above aspects was significantly improved after functional physical training.⁷ In the in-situ touch height test, the test scores of the experimental group did not increase significantly ($P > 0.05$). After the functional physical training, the experimental group showed significant improvement in the test scores of the other five test indicators except for the in-situ touch height project.

In the same training time, the scores of the nine athletes in the control group in the six experimental items in the conventional physical training are compared with those before the test, as shown in Table 3. From Table 3, it can be seen that the scores of the athletes in the control group in the standard sit-ups, the 3200-meter long-distance running, the 17 items on the edge of the basketball court, and the running touch-height items after receiving traditional physical training have significant statistical significance ($P < 0.05$). The control group's performance in the above aspects was significantly improved after physical training.⁸ There was no significant difference in the mean test scores in the physical sensitivity test of the in-situ touch height and the restricted site ($P > 0.05$). The control group has generally made significant progress in the other four test items after physical training, except for in-situ touch height and physical acuity detection in limited areas.

This paper analyzes the results of the six experimental items in the control and experimental groups to verify their effectiveness further. Table 4 lists the conclusions of this analysis.

Table 2. Comparison results before and after the test of the six test items in the experimental group.

Test content	Before experiment	After the experiment	P
Standard push-ups	9.38±0.66	10.52±1.07	$P < 0.05$
Touch high	284.69±11.69	285.83±12.54	$P > 0.05$
3200m track and field run	17.06±0.89	16.05±0.81	$P < 0.05$
Limited area body acuity detection	29.75±2.82	28.05±2.03	$P < 0.01$
Four times the basketball court sideline 17 turns back	1.17±0.21	1.13±0.19	$P < 0.05$
run-up touch	289.27±9.67	296.98±10.45	$P < 0.05$

Table 3. Comparative analysis of the test results of the six experimental items in the control group and before the experiment.

Test content	Before experiment	After the experiment	P
Standard push-ups	9.06±0.75	12.4±0.89	$P < 0.01$
Touch high	285.52±10.34	285.63±10.09	$P > 0.05$
3200m track and field run	16.39±0.73	14.92±0.73	$P < 0.05$
Limited area body acuity detection	29.78±2.15	29.33±2.32	$P > 0.05$
Four times the basketball court sideline 17 turns back	1.18±0.38	1.15±0.3	$P < 0.05$
Run-up touch	289.69±8.67	293.02±7.6	$P < 0.05$

Table 4. Comparative analysis of the pre-and post-test performance of the six experimental items in the two groups.

Test content	Test Group	Control group	P
Standard push-ups	10.52±1.07	12.4±0.89	$P > 0.05$
Touch high	285.83±12.54	285.63±10.09	$P > 0.05$
3200m track and field run	16.05±0.81	14.92±0.73	$P > 0.05$
Limited area body acuity detection	28.05±2.03	29.33±2.32	$P < 0.01$
Four times the basketball court sideline 17 turns back	1.13±0.19	1.15±0.30	$P < 0.05$
Run-up touch	296.98±10.45	293.02±7.60	$P < 0.05$

The scores of both the experimental and control groups were significantly improved in the regular sit-up event and the 3200-meter reciprocal event ($P > 0.05$). This suggests that functional fitness training has no significant advantage over regular physical activity.⁹ There was no significant difference in the test scores of the two groups in the in-situ touch height project ($P > 0.05$). This suggests that functional fitness training has no significant advantage over regular physical activity. The physical sensitivity of the control and experimental groups was significantly improved ($P < 0.05$). This shows that functional physical training has obvious advantages in improving the performance of the above items compared with conventional physical training.

DISCUSSION

The comprehensive qualities of basketball players include explosiveness, endurance, speed, agility, and flexibility. Routine physical and functional physical training complement each other in the physical training of youth basketball teams. So, coaches should pay attention to balanced physical training.¹⁰ Physical training should ensure overall effectiveness and increase the proportion of specific physical training. Only by ensuring the balance and rationality between the two can better promote the comprehensive quality development of young basketball players. The overall physical fitness test should be carried out first in the physical training of youth basketball. After fully understanding the individual differences of athletes, coaches conduct targeted training. In regular physical training, coaches must organically link technique and physical training. This enables him to improve his physical quality and technical abilities. For example, in cultivating youth's comprehensive qualities such as strength, speed, and endurance, various competitions can be carried out regularly to improve

competitive skills. In addition, athletes need to undergo rehabilitation after physical training. This avoids problems such as muscle fatigue and injury. This will promote the rapid recovery of the body. Athletes should always ensure that their bodies are in a healthy stage. Athletes can jog, walk, massage muscles, and do other sports for a long time.

CONCLUSION

After the functional physical training, the basketball team of the experimental group had a more noticeable improvement in

comprehensive physical fitness. Its characteristics are that the body's agility, coordination, lower extremity explosiveness, and movement speed have improved effectively. After regular physical training, boys' youth basketball players have achieved remarkable absolute strength and stamina results. In general, functional physical training is superior to conventional physical training.

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